spectively reviewed. Clinical data was evaluated including demographics, hospital course, types of vascular procedures, length of stay (LOS), and in-hospital mortality outcomes.

Results: A total of 183 patients with EDS were identified (mean age 32±17yrs, 102 females) including 25 diagnosed with type IV EDS. These individuals collectively underwent 32 endovascular & 18 open procedures for vascular disease during the time period, including abdominal & peripheral aneurysm repairs (n=30), and reno-visceral artery or vein embolization (n=20). Endovascular procedures were associated with a median LOS (IQR) of 2 (1-3) days with no procedure related mortality or in-hospital deaths, while open vascular procedures had median LOS (IQR) of 7 (3-9) days with 1 (6%) in-hospital death.

Conclusions: The elective surgical management of vascular complications in EDS patients using open and endovascular procedures has been associated with good outcomes. Our results suggest that vascular interventions in these EDS patients can be safely performed and should not be withheld until rupture or acute symptoms arise.

Author Disclosures: B.S. Brooke, None; **N.B. McDonnell,** None; **J.H. Black,** None.

S5: SVS Plenary Session

SS27.

Loss of STAT1 is Associated with Increased Aortic Rupture in an Experimental Model of Aortic Dissection

Matthew J Eagleton, Jun Xu, Brittney Parine, Mingfang Liao, Guy Chisolm, Linda M Graham. Cleveland Clinic Foundation, Cleveland, OH

Background: Signal transducer and activator of transcription (STAT) 1 has been linked to a variety of pathologic states involved with matrix remodeling, but its role in aortic pathology has not been previously described. The current study hypothesizes that STAT1 regulates aneurysmal degeneration in a mouse model of aortic dissection.

Methods: Apolipoprotein E knockout mice (ApoE−/−) (n=65) or ApoE/STAT1 (n=25) double knockout mice (ApoE/STAT1−/−) were infused with 1000 ng/kg/min of angiotensin II (Ang II). Systolic blood pressure (SBP) was measured in the rodent tail. At sacrifice, aortic diameters and extent of aneurysm formation were measured by digital microscopy. STAT1 and phosphorylated-STAT1 (P-STAT1) protein levels were assessed in ApoE−/− mice at 0, 7, 14, and 28 days (n=8/time point) by ELISA. Histology was performed using H&E and Movat stains. Statistical analyses included chi-square test, T-test, and ANOVA.

Results: Aneurysms occurred in 8%, 50%, and 80% of apoE−/− mice at 7, 14, and 28 days respectively. Total STAT1 levels were not altered during the course of Ang II infusion, but P-STAT1 levels peaked at 7 days with a 1.4-fold increase over baseline (P<0.05). Aneurysms occurred in 0%, 100%, and 100% of apoE/STAT1−/− mice at 3, 5, and 28 days. In mice infused with Ang II for more than 3 days, aortic rupture occurred more frequently in apoE/STAT1−/− mice (53% v. 19%, P<0.05) and at earlier time points (4.0±0.5 v. 9.2±0.77 days, P<0.05) compared with apoE−/− mice. SBP did not differ between the groups during Ang II infusion. By 28 days, aneurysms were larger in apoE/STAT1−/− mice compared to apoE−/− mice (2.7±0.4 v. 1.9±0.1 mm, P<0.05), and were more extensive arising at the level of the left subclavian artery and extending to the infrarenal aorta. H&E and Movat stain did not reveal differences in aortic wall structural content at baseline between apoE−/− and apoE/STAT1−/− mice, and both groups demonstrated equal disorganization in the aneurysmal state.

Conclusions: P-STAT1 is elevated during aneurysm formation and its loss is associated with a higher rate of aortic rupture and more extensive aneurysms in a mouse model of aortic dissection. Further investigation is necessary to determine if these observations are secondary to an underlying aortic wall abnormality or alterations in vessel wall matrix remodeling.

Author Disclosures: M.J. Eagleton, None; **J. Xu,** None; **B. Parine,** None; **M. Liao,** None; **G. Chisolm,** None; **L.M. Graham,** None.

SS28.

Who is the Integrated 0+5 Vascular Surgery Residency Applicant?

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Objective: The 0+5 integrated vascular surgery residency has altered the training paradigm for future vascular specialists. Rising interest in these novel programs highlights our need to better understand the applicant pool. We surveyed recent applicants to our integrated program to gain more insight into their background and motivation for accelerated vascular training.

Methods: Responses from 53 integrated vascular surgery (VS) residency applicants were compared to general surgery (GS) residency applicants (n=33) at a different institution. There was no overlap of applicants between programs. Applicants were queried regarding their background, personal experience, prior exposure to vascular surgery, and motivations for residency selection via an anonymous and voluntary web-based survey.

Results: Demographics and prior exposures to vascular surgery are outlined in Table 1. The majority of career choices (65%) were made during the 3rd and 4th years of medical school. Factors strongly influencing the decision to choose VS as a career were challenging open vascular operations (87.5%), endovascular technologies (92.3%), and vascular surgeon mentorship (75%). The most common reasons cited for pursuing integrated 0+5 VS training were 1) more focused training/integration of cardiovascular medicine (90.4%), 2) interest in catheter-based endovascular therapies (86.3%), and 3) shorter time in training (69.3%). Of the GS applicants, 58% indicated they would apply to an integrated residency in their sub-specialty of interest, and 45% listed vascular surgery as a potential fellowship option after general surgery.

Conclusions: Applicants to 0+5 integrated vascular residencies were more likely to have rotated on a vascular surgery service, observed vascular cases, identified a vascular surgery mentor, and been involved in cardiovascular research. Institutional strategies to increase medical student exposure to vascular surgery will optimize our ability to attract and train optimal candidates.

Demographics	*VS applicants (n=53)*	*GS applicants (n=33)*	*p-value*
Age	28.9	26.9	.02
% Female	23%	33%	.4
% Advanced degree	17%	9%	.49
Vascular Surgery Exposure			
% Rotation on VS	87%	45%	.0001
Months on VS rotation	1.9	0.5	<.0001
VS cases observed	52	14	<.0001
% VS mentor	91%	45%	<.0001
Research experience (months)	7.1	5.5	.16
% Cardiovascular research	51%	21%	.01
% Exposure to simulation	51%	45%	.78

Author Disclosures: J.T. Lee, None; **M. Teshome,** None; **C. de Virgilio,** None; **R.L. Dalman,** None.

SS29.

An Increasing Demand for Integrated Vascular Residency Training Far Outweighs the Limited Supply of Positions

Andres Schanzer, Jeffrey Nahmias, Kathleen Korenda, Mohammad Eslami, Elias Arous, Louis Messina. University of Massachusetts Medical School, Worcester, MA

Objective: The integrated vascular residency training paradigm ("0 + 5") was first approved by the ACGME in 2006 with the first residents beginning in 2007. We sought to evaluate the demand for these new positions and to better understand applicant pool demographics.

Method: The AAMC was petitioned for data on applicants to traditional and integrated vascular training programs (years 2006-2009). In addition, 111 applications received at a single academic institution for the year 2009 were reviewed in depth.

Result: The number of traditional fellowship applicants and the corresponding number of positions remained stable (Table 1). In contrast, the number of integrated applicants increased dramatically, with 152 applicants seeking to match into 18 available positions in 2009 (88% of integrated, 11% of traditional won't match, p<.001). The most notable difference between integrated and traditional applicants is the number of foreign medical graduates (68.7% vs. 26.7% in 2008, p<.001, Table 2). Of the 111 integrated applicants applying for our single position (72% entire 2009 applicant pool, Table 3), 88.3% are residing in the US. Furthermore, 25.2% of applicants completed ≥ 1 year at a US institution for research or a general surgery prelim year. Integrated applicants' mean USMLE Step 1 and 2

scores were 89.1 and 89.5. On average, an integrated applicant had published 2.8 peer-reviewed publications.

Conclusion: The number of talented and motivated integrated applicants far outweighs the number of available positions. Growing interest in more efficient and comprehensive training will continue to augment demand. As educators, vascular surgeons should seize this opportunity and aggressively expand the number of available positions.

Traditional and Integrated Supply and Demand	Traditional Fellowship	Integrated Residency
Application Year		**2006**
Number of Available Positions	112	0
Number of Applicants	145	0
Ratio of Positions to Applicants	0.77	n/a
Application Year		**2007**
Number of Available Positions	119	4
Number of Applicants	152	n/a
Ratio of Positions to Applicants	0.78	n/a
Application Year		**2008**
Number of Available Positions	116	9
Number of Applicants	131	112
Ratio of Positions to Applicants	0.89	0.08
Application Year		**2009**
Number of Available Positions	116	18
Number of Applicants	n/a	152
Ratio of Positions to Applicants	n/a	0.13

n/a, not available.

2008 Applicant Pool	Traditional Fellowship	Integrated Residency
Number of Applicants (n)	131	112
Age (mean)	32.1	30.1
Female (%)	18.3	16.1
White Race (%)	59.5	42
US Medical School Graduate (%)	73.3	31.3
US Citizen (%)	88.6	58
Residing in US (%)	97	82.4

2009 Integrated Vascular Residency Applicants to a Single Academic Center	
Number of Applicants (n)	111
Number of Available Positions (n)	1
Age (mean)	30.4 years
Male (%)	79.3
White Race (%)	33.3
Born in US (%)	23.9
US Citizenship (%)	39.6
Reside in US (%)	88.3
Completed Medical School (%)	68.5
US Undergraduate Degree (%)	39.6
US Medical School (%)	31.5
Foreign Medical School (%)	68.5
USMLE Step 1 Score (mean)	89.1
USMLE Step 2 Score (mean)	89.5
Number of Publications (mean)	2.8
*Non-MD Degree (%)	16.2
≥1 year in US for research or surgery prelim (%)	25.2
Worked as MD Abroad (%)	28.4

*PHD, MPH, RN, MBA, PHARMD

Author Disclosures: A. Schanzer, None; **J. Nahmias,** None; **K. Korenda,** None; **M. Eslami,** None; **E. Arous,** None; **L. Messina,** None.

SS30.

The Role Of Robotic Endovascular Catheters In Fenestrated Stent Grafting

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Backround: Advances in stent graft technology have allowed the treatment of complex thoraco-abdominal aneurysm disease via a total endovascular approach but the procedure can be technically challenging and time consuming.

Methods: A 4-vessel fenestrated stent graft partially deployed within a CT-reconstructed pulsatile Type-II thoraco-abdominal aneurysm silicon model was used. Twelve vascular specialists were asked to cannulate the renal and visceral vessels under fluoroscopic guidance, using conventional and robotic techniques. Quantitative (catheterization times and wire/catheter tip movements) and qualitative metrics (validated procedure-specific-rating scale (IC3ST), which grades operators on catheter use, instrumentation, successful cannulation/catheterisation and overall performance assessed by two blinded observers (Cronbach's $\alpha=0.94$)) were compared (Wilcoxon signed-rank test).

Results: Median procedure times for cannulation of all 4 vessels were reduced using robotic catheters (2.9min IQR(2.3-4.2) versus 14min(11.1-19.6); p=0.002). The total number of wire/catheter movements taken to complete the task was also significantly reduced (38 IQR(27.3-64.8) versus 423(221-662); p=0.002). There were significant differences in time and movement for cannulation of each individual vessel in the phantom. Robotic catheter operator radiation exposure was minimal. Procedure-specific performance scores were significantly improved with robotic catheterization despite minimal operator exposure (IC3ST score 29/35 IQR(21.8-30.6) versus 18.8/35 (11.5-24.1); p=0.006).

Conclusions: Robotic catheterisation of target vessels during this procedure is feasible and minimises radiation exposure for the operator. Steerable robotic catheters with intuitive control may overcome some of the limitations of standard catheter technology, enhance target vessel cannulation, reduce instrumentation and improve overall performance scores.

Author Disclosures: C.V. Riga, None; **C.D. Bicknell,** None; **M.S. Hamady,** None; **N.J. Cheshire,** None.

S6: SVS Plenary Session

SS31.

Protamine Reduces Bleeding Complications Associated With Carotid Endarterectomy Without Increasing the Risk of Stroke

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Objectives: Controversy exists about whether protamine given during carotid endarterectomy (CEA) prevents bleeding or increases thrombotic complications such as stroke or myocardial infarction (MI). The purpose of this study was to determine the effect of protamine reversal of heparin anticoagulation on the outcome of CEA.

Methods: A prospective regional registry in Northern New England of 4,712 patients undergoing CEA by 66 surgeons from 11 centers from 2003-2008, was reviewed. Protamine use varied by surgeon (38% routine use, 44% rare use, 18% variable use). The primary endpoint was postoperative bleeding requiring reoperation. Secondary endpoints included stroke, death and MI. Predictors of endpoints were determined by univariate analysis using Pearson chi-square (Fisher's exact correction) and multivariate logistic regression.

Results: Among 4712 patients undergoing CEA, 46% received protamine while 54% did not. Patients who did not receive protamine had a 2.6-fold increase in reoperation for bleeding (Table). Protamine use did not affect the rate of stroke, death, or MI. By multivariate analysis, protamine reduced bleeding complications after accounting for other potential predictors of bleeding including center variation, surgical technique, and antiplatelet therapy; (OR 0.43, 95% CI 0.18-0.98, P<.05). Consequences of reoperation for bleeding were a 7-fold increase in stroke, a 30-fold increase in death and a 4-fold increase in MI.

Conclusion: Protamine reduces serious bleeding complications during CEA without increasing the risk of stroke, death, or MI. Thus, protamine is both safe and beneficial during CEA as practiced in this large, prospective registry. In light of substantial complications referable to bleeding, liberal use of protamine during CEA appears warranted.

	N	*Reoperation For bleeding*	*Stroke*	*Death*	*MI*
Protamine	2180	14 (0.64%)	17 (0.78%)	5 (0.23%)	24 (1.1%)
No Protamine	2532	42 (1.66%)	29 (1.15%)	8 (0.32%)	23 (0.91%)
Chi-square		P=0.001	P=0.20	P=0.57	P=0.51

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SS32.

Carotid Endarterectomy In Female Patients: Subsets Of Patients At Higher Surgical Risk

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Objectives: To evaluate early and late results of carotid endarterectomy (CEA) in female patients in a large single center experience.